preprogrammed, off-the-shelf, microprocessor chips available from E-M Technologies, Bala Cynwyd, Pennsylvania.

The processing deck 200 is shown schematically in FIGURES 3 and 4. FIGURE 3 represents a schematic plan view of a portion of the processing deck 200, and FIGURE 4 represents a schematic perspective view of the processing deck. The datum plate 82 forms the foundation of the processing deck 200 on which all stations are directly or indirectly attached.

Processing deck 200 includes a reaction receptacle input queue 150 which extends from opening 68 in front of housing 60. A plurality of reaction receptacles are loaded in a stacked fashion in the input queue 150. The purpose of the input queue is to hold a prescribed number of reaction receptacles and to sequentially present them at a pick-up position to be retrieved by a transport mechanism (described below). A reflective sensor at the pick-up position verifies the presence of a receptacle at that position. The input queue also includes a device for counting the number of receptacles resident therein at any given time.

A reaction receptacle shuttle assembly (not shown) within the queue moves the receptacles along a receptacle advance path toward the pick-up position. Optical sensors indicate when the shuttle assembly is in its home and fully extended positions. The queue includes a drawer which may be pulled out for loading the receptacles therein. Before the drawer is opened, however, it must be unlocked and the shuttle must disengage from the receptacle advance path. When the drawer is again closed, it is locked and the shuttle engages the receptacles and moves them toward the pick-up position. Optical sensors indicate when the drawer is closed and when the shuttle has engaged a receptacle. As each receptacle is removed from the pick-up position by the transport mechanism, the receptacle shuttle advances the receptacles one receptacle-width, so that the next receptacle is in the pick-up position.

The reaction receptacles are preferably integrally formed linear arrays of test tubes and known as multi-tube units, or MTUs. The preferred reaction receptacles (MTUs) will be described in more detail below.

A first ring assembly, which in the preferred embodiment comprises a specimen ring 250, is mounted on a pivoting jig plate 130 at a distance above the datum plate 82. Specimen ring 250 is generally circular and preferably holds up to nine specimen trays 300 in an annular fluid container carrier portion thereof, and each of the specimen trays preferably holds 20 specimen-containing containers, or test tubes 320. The specimen ring 250 is constructed and arranged to be rotatable about a first generally vertical axis of rotation and delivers the specimen tubes 320

to a specimen pipette assembly 450, preferably an automated robotic pipette system. The forward portion of specimen ring 250 is accessible through the flip-up carousel door 80 provided in housing 60 so that trays 300 of test tubes 320 can be easily loaded onto the specimen ring 250 and unloaded from the specimen ring. Specimen ring 250 is driven by a motor, as will be described in more detail below.

A second ring assembly, which in the preferred embodiment comprises a pipette tip wheel 350, is located in an interior portion of the specimen ring 250, so that at least a portion of the outer perimeter of the pipette tip wheel 350 is disposed radially inwardly of the inner periphery of the ring 250. Pipette tip wheel 350 carries thereon a plurality of commercially available packages of pipette tips. Pipette tip wheel 350 is motor driven to rotate independently of specimen ring 250 about a second axis of rotation that is generally parallel to the first axis of rotation of the specimen ring 250.

An inner rotatable assembly constructed and arranged to carry a plurality of fluid containers is provided at an interior portion of the pipette tip wheel 350. In the preferred embodiment, the inner rotatable assembly comprises a multi-axis mixer 400 located radially inside the pipette tip wheel 350 (i.e., the second ring assembly) and specimen ring 250 (i.e., the first ring assembly). The multi-axis mixer 400 includes a rotating turntable 414 that is rotatable about a third axis of rotation that is generally parallel to the first and second axes of rotation and on which are mounted four independently and eccentrically rotating container holders 406. Each of the container holders 406 receives a container, preferably in the form of a plastic bottle, containing a fluid suspension of magnetic particles with immobilized polynucleotides and polynucleotide capture probes. Each container holder 406 is generally cylindrical in shape and includes an axis of symmetry, or axis of rotation. The multi-axis mixer 400 rotates each of the containers eccentrically with respect to the center of the holder 406, while simultaneously rotating the turntable 414 about its center so as to provide substantially constant agitation of the containers to maintain the magnetic particles in suspension within the fluid.

The specimen pipette assembly, or robot, 450 is mounted to the frame structure 62 (see FIGURE 2) in a position above the specimen ring 250 and pipette tip wheel 350. The specimen pipette assembly 450 includes a pipette unit 456 having a tubular probe 457 mounted on a gantry assembly to provide X, Y, Z motion. Specifically, the pipette unit 456 is linearly movable in the Y-direction along a track 458 formed in a lateral rail 454, and the lateral rail 454 is longitudinally movable in the X-direction along a longitudinal track 452. The pipette unit 456

provides vertical, or Z-axis motion of the probe 457. Drive mechanisms within the specimen pipette assembly 450 position the pipette unit 456 to the correct X, Y, Z coordinates within the analyzer 50 to pipette fluids, to wash the probe 457 of the pipette unit 456, to discard a protective tip from an end of the probe 457 of the pipette unit 456, or to stow the pipette unit 456 during periods of nonuse, e.g., in a "home" position. Each axis of the specimen pipette assembly 450 is driven by a stepper motor in a known and conventional manner.

The pipette assembly is preferably an off-the-shelf product. Presently preferred is the Robotic Sample Processor, model number RSP9000, available from Cavro Inc. of Sunnyvale, California. This model includes a single gantry arm.

The specimen pipette assembly 450 is preferably coupled to a syringe pump (not shown) (the Cavro XP 3000 has been used) and a DC driven diaphragm system fluid wash pump (not shown). The syringe pump of the specimen pipette assembly 450 is preferably mounted to the internal frame structure 62 within the housing 60 of the analyzer 50 at a position above the left-hand side of the chemistry deck 200 and is connected to pipette unit 456 by suitable tubing (not shown) or other conduit structures.

A specimen preparation opening 252 is provided in the jig plate 130, so that the specimen pipette assembly 450 can access a reaction receptacle 160 in the input queue 150 located below the jig plate 130.

The specimen pipette assembly 450 of the analyzer 50 engages specimen tubes 320 carried on the specimen ring 250 through openings 140, 142 of an elevated cover plate 138 and engages pipette tips carried on the pipette tip wheel 350 near the back portions of the specimen ring 250 and pipette tip wheel 350, respectively. Accordingly, an operator can have access to the forward portions of specimen ring 250 and pipette tip wheel 350 through the carousel door opening 80 during operation of the analyzer without interfering with pipetting procedures.

A tip wash/disposal station 340 is disposed adjacent to the specimen ring 250 on the jig plate 130. Station 340 includes a tip disposal tube 342 and a wash station basin 346. During specimen preparation, the pipette unit 456 of the specimen pipette assembly 450 can move into position above the wash station basin 346 where the tubular probe 457 can be washed by pumping distilled water through the probe 457, the basin of the wash station 346 being connected, preferably by a flexible hose (not shown), to a liquid waste container in the lower chassis 1100.